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The Population of Ontario

from

1921 to 1965.

Prepared by the Division of Psychiatric Research

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THE POPULATION OF ONTARIO FROM 1921 TO 1965

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1. Introduction

A study of the age structure of the population of Ontario has been undertaken because that structure determines in considerable part the incidence of disease, generally, and psychosis, in particular. The number of people to be expected in various age groups during the two coming decades is of particular importance. Since, however, any such estimate for the immediate future is dependent, to a considerable extent, on the trends of mortality and of fertility, a general review of the state of the population of Ontario during the past two decades became necessary.

2. The probability of death

The first consideration, in either a review of the past or an anticipation of the future, is naturally that of the chance of death. This chance will be considered in detail for the first year of life and then more broadly for the rest of life.

In the study of the probability of death in infancy (age less

than one year), mortality tables of the customary type¹ were calculated and are fundamental to much of the following work. In order, however, to show the phenomenon, involved, in a form, subsequently convenient for the duration of life, it is presented in Table I as deaths per week per 100,000 children entering various periods during the first year of life for the census years 1921-41. The well-known reduction in the chance of death, that has occurred in the period involved, is clear. It is apparent, also, how much more considerable, proportionately, has been the reduction for children nearing one year of age than for children just born. This point is illustrated by Fig. 1, where the logarithms of the values in Table I are plotted for boys. It should be remembered that in such a diagram, equal distances represent equal proportions and then it can be seen that the proportionate reduction is comparatively

TABLE I. THE NUMBER OF DEATHS PER WEEK PER 100,000 CHILDREN ENTERING VARIOUS PERIODS DURING THE FIRST YEAR OF LIFE.

AGE	MALES			FEMALES		
	1921	1931	1941	1921	1931	1941
Under 1 wk.	3604	3081	2455	2808	2436	1888
1 week	636	492	287	492	344	204
2 week	442	334	166	388	242	140
3 wks.-1 mon.	331	224	140	233	203	91
1 month	206	141	104	153	116	71
2 month	181	123	76	135	96	72
3 month	177	103	64	106	77	48
4 month	142	84	61	114	74	44
5 month	106	87	46	95	71	30
6 month	108	68	39	94	66	24
7 month	100	72	30	69	52	26
8 month	82	54	13	66	41	26
9 month	72	49	25	58	37	18
10 month	64	36	24	45	36	13
11 month	63	38	14	55	34	13

¹ The chance of death was calculated by, at first, days, then by weeks and, finally, by months, from the published data on age at death (during the first year of life) and birth by month of the calendar, for a constant number of births.

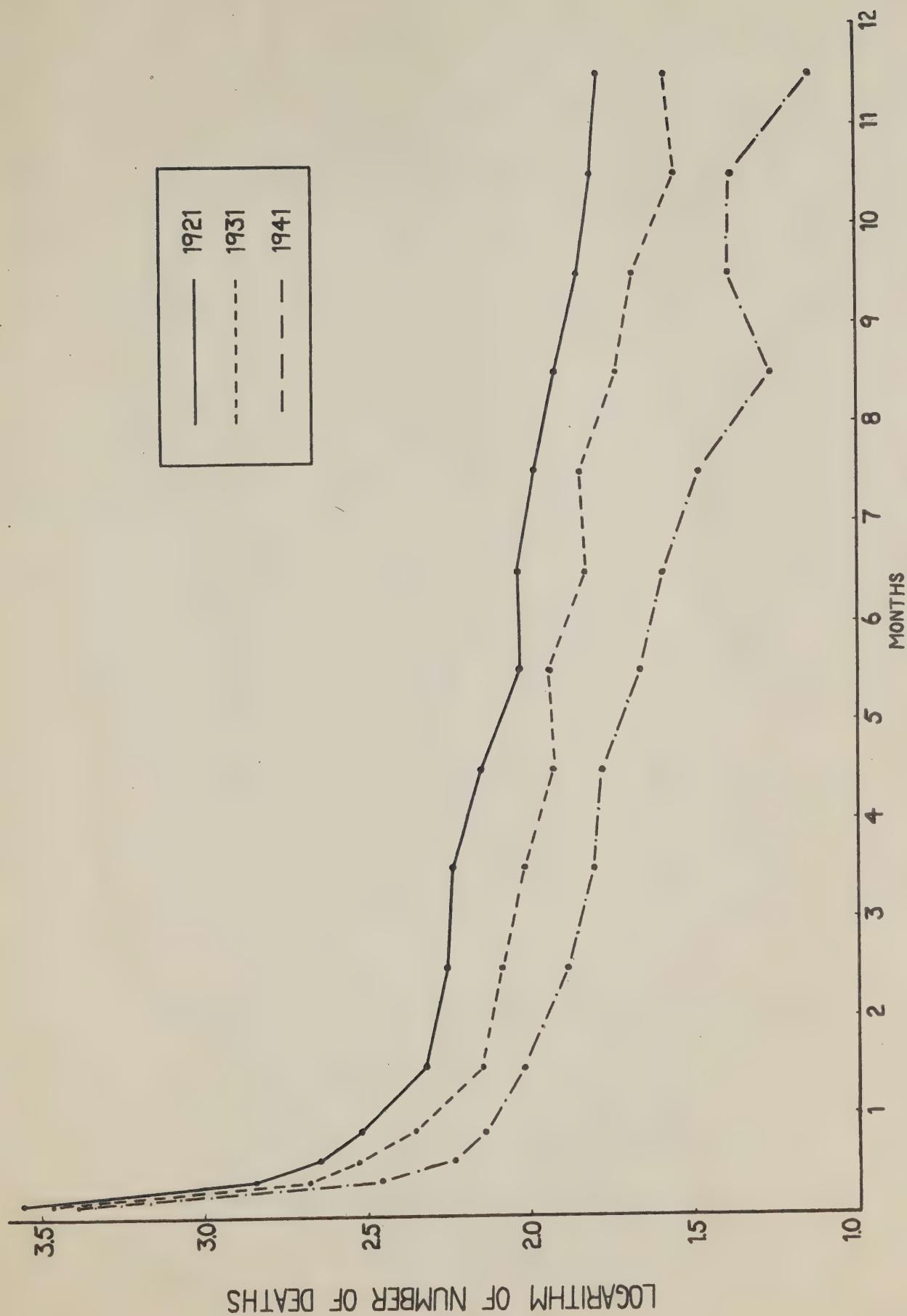


FIG. 1. THE LOGARITHM OF THE NUMBER OF DEATHS AMONG BOYS DURING THE FIRST YEAR OF LIFE

small just after birth. The corresponding diagram for girls is not presented because it merely exhibits the same characteristics, modified by the lower death rates for their sex.

For the entire range of life, the probable number of people dying out of 100,000 entering each year of life was found (by sex and by single years of life), in the way² usual in such studies as the present, for the census years, 1921-41. These results are conveniently summarized in Table II by the average number of deaths per 100,000 souls per year, dying in each 5-year period of life. The logarithms of the latter values for males are shown in Fig. 2, where it can be seen that the chance of death has been reduced from infancy to about the age of 50, after which time it has perhaps increased slightly. It should again be noted when the proportionate gain is greatest, i.e., in late childhood and early adulthood, rather than in early childhood, although the actual number of lives saved is greater in the earlier period. In Fig. 3, where the corresponding results for females are shown, it can be seen that the situation is pretty well the same except that the improvement continues throughout life.

If the recent reductions in death rates are maintained or continued, the proportion of old people in the population must, of course, increase, apart from any changes in birth rates. Also, the number of old women relative to old men will become ever greater since the chance of the former dying is falling.

From Fig. 2 and 3 it can be seen that the drop in numbers of deaths was generally proportionate during the two decades although perhaps a little the greater in the second decade. To obtain projections for the death rate during the two decades, following 1941, it was supposed that the drop

²

The death rate within the year was calculated as the ratio of deaths, in a given year, to the number of people of the given age present at the census plus half the number that died.

drop will continue in the same proportion³ per annum as for the last two decades. Such a supposition will make the absolute reduction smaller than in the past and so is presumably not unduly sanguinary.

TABLE II. THE NUMBER OF DEATHS PER 100,000 SOULS

AGE	MALES			FEMALES		
	1921	1931	1941	1921	1931	1941
Under 1 ⁴	10,345	7,672	5,172	8,013	6,167	3,974
1	1,336	882	423	1,190	770	356
2	760	438	261	824	365	207
3	477	307	201	492	246	161
4	439	228	177	475	201	118
5 - 9	326	198	126	272	135	82
10 - 14	185	151	103	198	125	76
15 - 19	306	234	178	245	183	103
20 - 24	371	301	222	345	276	136
25 - 29	431	328	202	427	314	178
30 - 34	414	344	233	448	347	215
35 - 39	488	427	336	569	436	272
40 - 44	607	554	470	631	495	369
45 - 49	707	751	681	756	680	546
50 - 54	1,074	1,107	1,146	1,073	952	799
55 - 59	1,623	1,653	1,707	1,412	1,433	1,240
60 - 64	2,372	2,442	2,595	2,145	2,069	1,826
65 - 69	3,640	3,783	3,872	3,530	3,251	2,934
70 - 74	6,118	5,872	5,873	5,857	5,157	4,663
75 - 79	9,413	9,570	9,371	8,835	8,896	7,908
80 - 84	13,294	14,203	13,906	13,152	13,632	12,444
85 - 89	20,502	20,986	20,789	20,039	19,627	19,047
90 - 94	25,837	28,733	28,121	27,027	27,130	26,323
95 - 99	27,586	33,708	33,139	33,402	31,261	31,865

³ A straight line was fitted, by least squares, to the logarithm of the death rate for each year of age at the 3 census years under consideration, so that the death rate during the period, 1921-41, could be found by interpolation and during 1941-65, by extrapolation.

⁴ For children under one year the value shown is that obtained from the returns of births and deaths under one year. For children one year old the estimate of population was modified from the census returns as discussed in Appendix B.

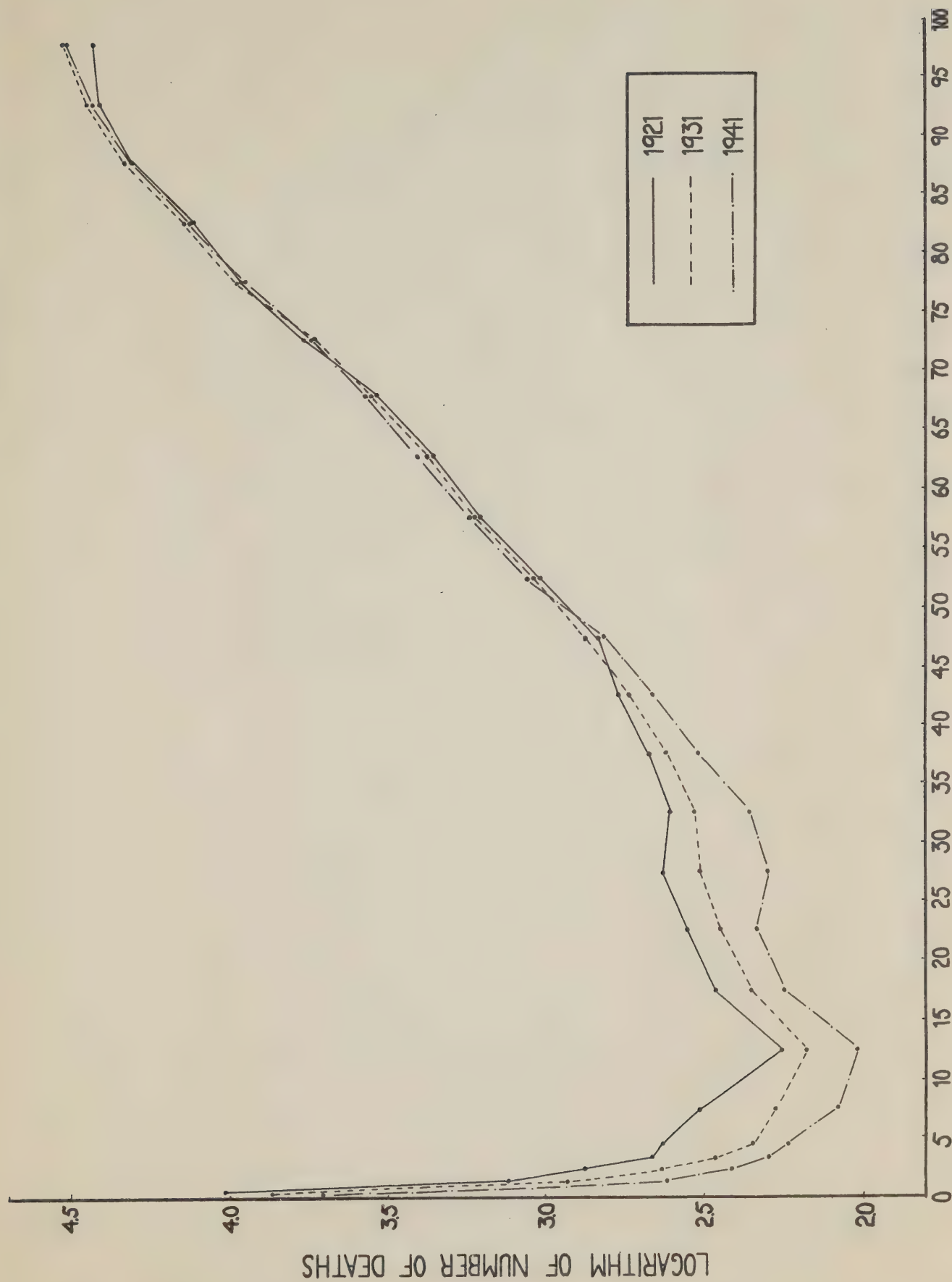


FIG. 2. THE LOGARITHM OF THE NUMBER OF DEATHS PER 100,000 MALES PER YEAR

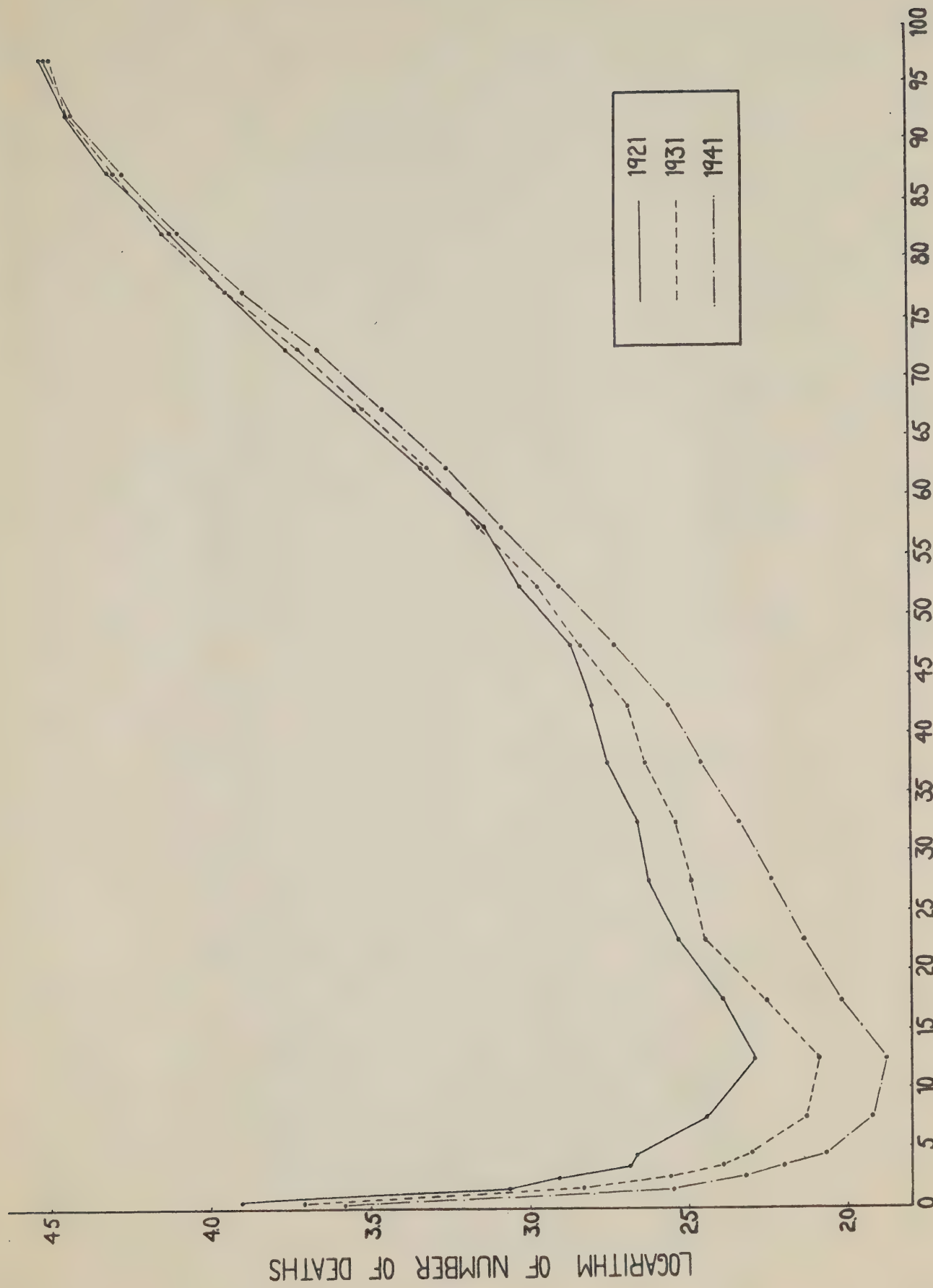


FIG. 3. THE LOGARITHM OF THE NUMBER OF DEATHS PER 100,000 FEMALES PER YEAR

3. The Trend of Fertility.

While death rates, are the first consideration in estimating the future population, since they will determine the number of people in most age groups, the trend of fertility is also important, since it will principally determine the population in the early years of life (as far up as age 22 in 1965). In connection with death rates, the conditions of the future are reasonably sure but in connection with birth rates, the situation is more uncertain, as can be appreciated by events at the time of writing. As is well-known, the numbers of births recorded in Ontario, currently, i.e., since the start of the Second German War, has risen considerably over that obtaining in the years immediately previous. At other times, as during the economic depression preceding the war, the number of births may be expected to fall temporarily. Nevertheless, as will be shown immediately below, certain broad tendencies have over-ridden the times for two decades and will probably continue, in considerable measure, for as long a period. A certain adjustment in the anticipated number of births for the immediate future is discussed in Appendix A.

The broad tendencies of the birth rate can be seen from the calculations of Table III where the number of births per 100,000 women in Ontario was found, with respect to their age at the census years and

TABLE III. BIRTHS PER 100,000 WOMEN IN ONTARIO.

	Experience					Anticipation				
Women	1921	1926	1931	1936	1941	1946	1951	1956	1961	
10-14	12	12	20	19	17	22	24	28	31	
15-19	3,534	3,037	3,541	3,016	3,663	3,412	3,434	3,457	3,474	
20-24	15,034	12,144	12,767	11,468	13,341	11,799	11,253	11,120	10,795	
25-29	17,347	15,048	14,546	12,245	13,745	11,847	11,078	10,358	9,680	
30-34	14,298	12,727	11,500	9,319	9,629	8,149	7,298	6,537	5,854	
35-39	9,825	8,453	7,405	5,980	5,591	4,684	4,042	3,488	3,010	
40-44	3,888	3,496	2,856	2,319	1,905	1,613	1,322	1,117	930	
45-49	493	356	294	189	159	115	82	64	48	
50-54	17	6	7	6	1	1	0	0	0	

intercensal points (1926 and 1936)⁵ These birth rates are plotted in Fig. 4. It will be seen that the number of children per 100,000, by mothers under 20 years of age has shown, over the last two decades, no sign of falling; that the number of children by mothers over 40 has been falling extremely rapidly; and that the situation between these extreme ages is intermediate, i.e., more reduction occurred as the age of the women rose. From Fig. 4, it is very plain that the number of births by older women followed its trend very steadily, although the number by younger women was subject to considerable fluctuation, depending on the times. The general shape of the trend of births, i.e., family limitation by a reduction in births by older women, is clear, and has been progressing most rapidly. It cannot be supposed that such a trend will halt overnight but rather that it will continue, in considerable measure, for some decades to come. Accordingly, the anticipated birth rates, by age of women, were found on the assumption that the reduction, for a given age of women, during the two decades following 1941, would be proportionately the same (allowing a smaller absolute reduction) as in the two decades preceding 1941. The anticipated values are added to Table III.

4. Net Migration into Ontario

Besides death and birth, there remains one vital influence in the structure of the future population of Ontario, viz., migration, on which no data are as yet published, for it is difficult to follow directly. The net migration may, however, be estimated by working from one census to the next, with allowance for the intervening births and deaths; any residual change in population should be due in considerable part to net migration. Thus, it may be found how many souls of a given age (over 10 years) should be in Ontario,

⁵ At the intercensal points, the number of women, by age, was estimated by linear interpolation from the numbers at the census.

⁶ A linear extrapolation, fitted by least squares, on the logarithms of the values in Table III was used.

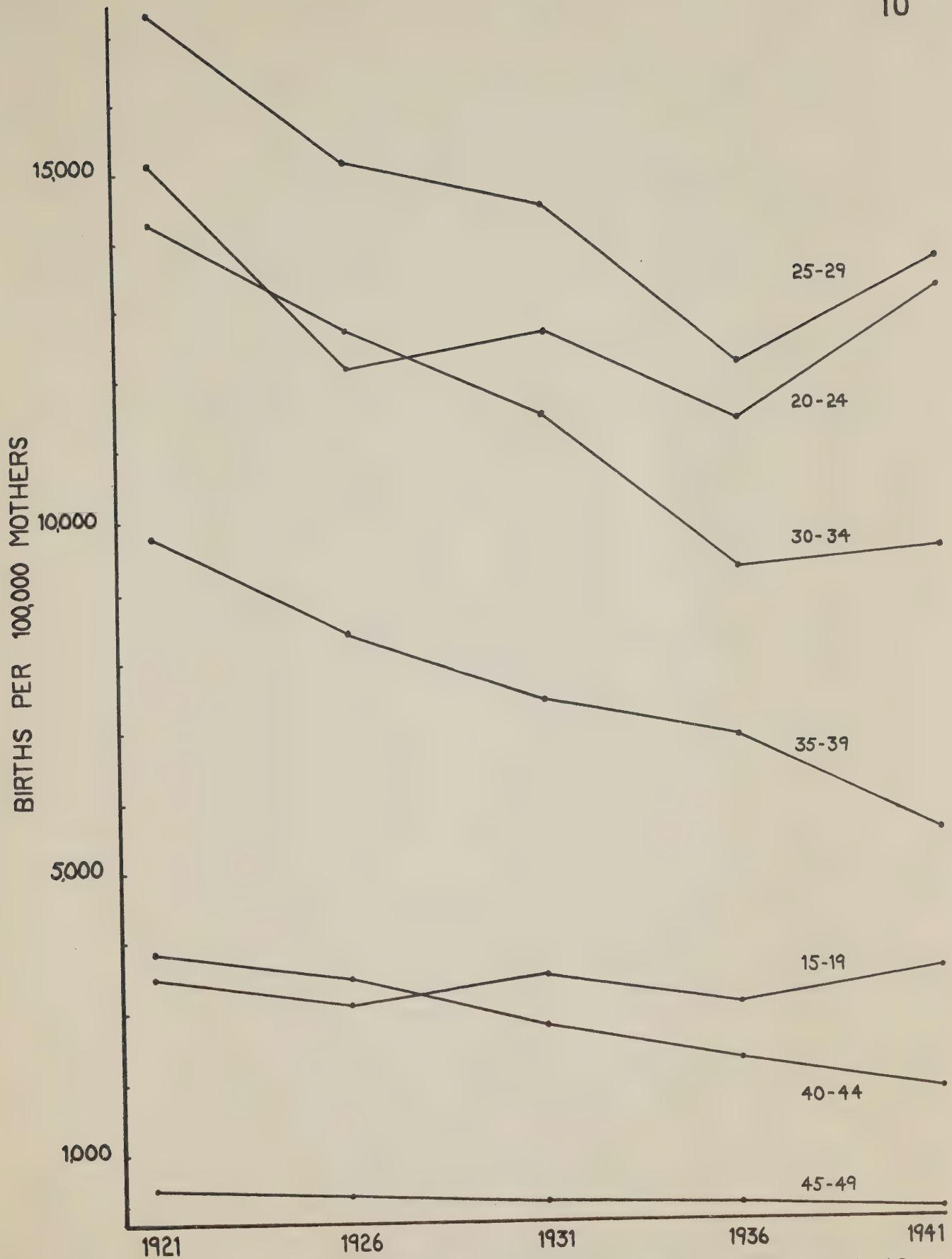


FIG. 4. THE TREND OF FECUNDITY BY AGE OF MOTHER IN ONTARIO

in say, 1931, from the number 10 years younger, who were present in 1921, when allowance is made for deaths,⁷ year by year, that occurred between the two census years.

The population to have been expected in Ontario at the census of 1931 and at that of 1941⁸ was found, on the lines just indicated, by single years of life and the results summarized by 5 - year periods of life in Tables IV and V respectively. In addition the estimated increase over the preceding census, and the extent to which the estimate fell short of the observation (net migration) are shown.

From Table IV it can be seen that the estimated (natural) increase accounted for 176,099⁹ out of the total increase of 268,770¹⁰ observed for males between the census of 1921 and 1931 or 66% and migration for 34% (the false returns of age must cancel so far as the total population is concerned). During the same period, the increase for females was 76% ascribable to natural increase and 24% to migration. From Table V it can be found that the increase in males was 75% natural and 25% migration and the increase in females 82% natural and 18% migration. The high proportion of male migrants during the generally prosperous decade of 1921 - 31 is reasonable. The relatively greater migration of females during the decade of 1931 - 41 is probably to be explained by men established earlier bringing in their women.

⁷ The probability of death in a given year of life, found from the line fitted to the death rate, of Sect. 2, at the intercensal point, was used for the entire intercensal period, except for the first year of life for which annual interpolates were found. In the latter connection, births actually reported were used. For the census year, a particular calculation based on births and deaths during the 12 months preceding census day was made to obtain the number of souls in their first year of life on census day.

⁸

As a verification of the procedure of working from the intercensal death rates, a second projection was made from the census of 1931 to that of 1941, for males, by using the recorded deaths during the intervening period. The results were very close to those shown in Table V.

⁹ The excess of births over deaths actually recorded for males was 172,301 in the first decade and 134,712 in the second, or close to the results 176,099 and 135,503 obtained by using intercensal points on the trend of death rates.

¹⁰ The values in Tables IV and V for the first two years of life have been adjusted, on the lines indicated in Appendix B, for an apparent underestimation of returns at the census and the above indicated figure modified a little.

TABLE IV. ESTIMATES OF NET EXCHANGE IN 1921, EMPLOYING MORTALITY CONSIDERED, FROM THE CENSUS OF 1921

Age	MALES			FEMALES		
	Estimated Increase over 1921	Estimated Population	Migration or Discrepancy	Estimated Increase over 1921	Estimated Population 1931	Migration and Discrepancy
Under 5	2,794	162,047	1,917	2,598	153,852	2,295
5 - 9	2,172	157,926	10,858	1,321	153,666	10,574
10 - 14	15,042	154,584	7,087	13,813	150,252	6,417
15 - 19	24,607	152,639	10,724	23,003	149,797	5,807
20 - 24	19,749	136,024	11,689	10,016	133,575	9,965
25 - 29	5,806	123,888	12,000	2,772	123,135	5,673
30 - 34	-1,131	112,158	16,630	8,299	119,306	4,106
35 - 39	66	113,490	12,249	9,646	115,611	5,364
40 - 44	11,942	108,208	9,807	15,095	105,872	4,713
45 - 49	23,698	107,071	978	22,315	100,041	-1,906
50 - 54	17,230	39,287	2,304	15,341	84,409	1,674
55 - 59	17,555	74,722	-4,428	15,144	70,339	-3,508
60 - 64	11,834	61,066	-3,311	12,101	59,782	-2,586
65 - 69	8,726	44,485	1,738	10,365	44,359	2,151
70 - 74	9,328	33,653	1,928	9,913	33,757	2,459
75 - 79	4,907	19,388	320	4,138	19,292	995
80 - 84	1,449	9,125	158	1,343	9,753	721
85 - 89	211	3,320	31	221	3,728	570
90 - 94	117	845	-34	-29	947	171
95 - 99	-3	172	-24	-32	170	81
Total	176,099	1,663,900	92,671	177,383	1,634,649	55,736

TABLE V. ESTIMATES OF THE POPULATION IN 1941, INCREASING FORTALLY CONSIDERED, FROM THE CENSUS OF 1931

Age	MALES			FEMALES		
	Estimated Increase over 1931	Estimated Population	Migration or Discrepancy	Estimated Increase over 1931	Estimated Population 1941	Migration and Discrepancy
Under 5	-4,685	159,279	382	-5,720	153,433	477
5 - 9	-19,410	149,374	3,535	-19,373	144,867	3,739
10 - 14	-1,634	160,037	4,568	-703	155,966	4,233
15 - 19	3,004	133,367	5,766	6,939	162,543	4,440
20 - 24	10,802	153,515	5,064	11,001	154,541	5,869
25 - 29	23,450	159,387	536	23,949	152,757	3,026
30 - 34	15,139	143,927	1,665	16,896	140,308	604
35 - 39	6,255	131,994	7,111	4,335	125,310	3,965
40 - 44	5,972	123,987	4,300	8,677	113,262	2,772
45 - 49	11,329	119,378	31	17,573	115,708	-2,500
50 - 54	17,956	109,547	492	17,934	104,017	38
55 - 59	26,124	96,416	-2,402	22,915	89,746	-2,028
60 - 64	19,445	77,202	-1,937	18,219	75,415	-1,054
65 - 69	7,969	54,192	3,532	8,075	54,585	4,033
70 - 74	3,442	38,823	2,597	5,433	41,649	2,819
75 - 79	5,171	24,879	1,031	7,318	27,605	1,718
80 - 84	3,988	13,271	326	4,897	15,371	651
85 - 89	1,003	4,404	505	882	5,180	950
90 - 94	167	978	112	139	1,257	332
95 - 99	16	164	3	-28	223	76
Total	135,503	1,892,123	37,217	149,358	1,639,743	34,160

The age structure of the migration during the two decades (Tables IV and V respectively) is reasonably consistent. The migration for children (below 10 years of age) is not of great significance because, as is well-known, the census returns for young children tend to be defective; it is necessary to examine closely the data on this part of the population before proceeding to other work, as has been done in Appendix B. The pattern of migration subsequent to childhood has the same character in the two decades, although the immigration of young men was more extensive in the decade of "prosperity". The pattern of migration for women is reasonably consistent with that for men. It will be noted that the net migration for men between 55 and 64 years of age is negative while that from 45 to 49 is near zero in both periods. This effect is probably due to false returns of age at this time of life, particularly since the disturbance is the more marked for women. No doubt some of the migration into Ontario, shown among people over 64 years of age is due to the same tendency. Since, however, the disturbance appears to be reasonably constant, we may assume it will continue for two more decades and make allowance for it.

5. The anticipated population until 1965.

On the basis of the foregoing work the death and birth rates have been anticipated until 1965. The anticipation of migration rates (including false returns of age) is more involved and so is discussed in Appendix C. Using these estimates¹¹ and starting from the census of 1941, estimates were obtained, by single years of life, for the successive years until 1965 of

¹¹

The death rates used were those for year of life at the intercensal points 1946 and 1956 (for the period 1951-65) from the projections previously indicated. The birth rates were found as annual interpolates from lines fitted on age of women; the matter of births is discussed further in Appendix A.

the population in Ontario, by finding the number of children to be born, the survivors of all ages and then adjusting with the increments for migration as given in Appendix C. The results were summed by 5-year periods of life, as shown in Tables VI and VII, for males and females, respectively. It can be seen that a steady increase may be anticipated in the population up to that time. The number of children will probably fall a little; the number of young adults (20 - 29 years old) will certainly rise a good deal principally on account of the relatively great number of births during the Second German War and the number of older adults will be generally increased in all classes to rise some 50% for men over 65 years of age and almost 100% for women over 80 years. The situation can best be appreciated from Fig. 5 and 6 where the results of Tables VI and VII are shown diagrammatically.

In Table VIII the projection of total population (both sexes) is shown.

TABLE VI. THE EXPECTATION OF MALE POPULATION IN ONTARIO.

Age	1941 ¹²	1942	1943	1944	1945	1946	1947
Under 5	159,279	167,334	175,659	185,570	191,967	193,882	190,647
5 - 9	152,909	151,671	152,766	153,679	156,742	161,335	163,971
10 - 14	164,605	162,829	160,942	159,071	157,326	155,845	154,613
15 - 19	172,133	171,924	171,436	170,532	169,536	168,095	166,320
20 - 24	163,579	165,904	163,300	170,606	172,436	174,074	174,082
25 - 29	159,923	161,574	162,353	163,892	164,813	165,737	168,043
30 - 34	145,592	149,078	152,714	156,353	159,350	163,050	164,685
35 - 39	139,105	140,701	142,313	144,011	145,899	148,069	151,513
40 - 44	128,287	130,098	132,141	134,209	136,413	138,639	140,205
45 - 49	119,409	120,475	121,577	122,720	123,918	125,192	126,955
50 - 54	110,039	110,766	111,458	112,182	112,951	113,820	114,835
55 - 59	94,016	95,854	97,579	99,158	100,396	101,467	102,148
60 - 64	75,265	77,250	79,218	81,071	82,985	84,727	86,388
65 - 69	57,724	59,168	60,445	61,393	63,377	64,944	66,620
70 - 74	41,420	42,244	43,186	44,085	45,066	46,083	47,123
75 - 79	25,110	26,307	26,771	27,264	27,802	28,399	28,961
80 - 84	15,597	13,693	13,784	13,910	14,059	14,215	14,438
85 - 89	4,909	5,079	5,222	5,308	5,358	5,409	5,444
90 - 94	1,090	1,142	1,181	1,209	1,239	1,258	1,301
95 - 99	167	137	134	148	167	183	188
100+	25	20	20	20	19	17	14
Total	1,928,983	1,953,248	1,979,699	2,006,890	2,032,319	2,054,440	2,073,510

Age	1948	1949	1950	1951	1952	1953
Under 5	183,331	174,330	166,456	161,595	158,851	157,333
5 - 9	177,203	187,034	193,403	195,345	192,246	185,031
10 - 14	155,681	156,595	159,641	164,193	171,830	180,095
15 - 19	164,451	162,592	160,858	159,389	158,218	159,329
20 - 24	173,598	172,700	171,712	170,285	168,613	166,828
25 - 29	170,415	172,700	174,512	176,136	176,249	175,869
30 - 34	165,951	166,980	167,862	168,775	171,148	173,619
35 - 39	155,104	158,699	162,150	165,307	167,010	168,331
40 - 44	141,787	143,452	145,304	147,434	150,882	154,468
45 - 49	128,885	130,955	133,098	135,263	136,827	138,415
50 - 54	115,839	116,982	118,128	119,346	121,005	122,841
55 - 59	102,795	103,462	104,182	104,998	105,613	106,344
60 - 64	87,943	89,360	90,476	91,436	91,950	92,473
65 - 69	68,277	69,843	71,461	72,933	74,204	75,389
70 - 74	48,127	49,261	50,427	51,658	53,000	54,243
75 - 79	29,608	30,219	30,839	31,583	32,249	32,905
80 - 84	14,697	14,968	15,260	15,584	15,838	16,156
85 - 89	5,483	5,534	5,575	5,655	5,721	5,805
90 - 94	1,333	1,354	1,366	1,378	1,368	1,369
95 - 99	192	196	201	205	203	201
100+	14	14	15	17	18	18
Total	2,090,769	2,107,230	2,122,996	2,138,515	2,153,043	2,167,117

¹² The values shown here and in Table VII for "under 5" years of age have been adjusted on the lines indicated in Appendix B. Otherwise, the data for 1941 are those of the census.

TABLE VI. THE ESTIMATION OF MALE POPULATION IN ONTARIO (Concluded)

Age	1954	1955	1956	1957	1958	1959
Under 5	155,870	154,252	152,351	150,246	148,232	146,363
5 - 9	176,226	168,505	163,559	161,053	159,547	158,097
10 - 14	138,926	136,326	138,326	135,236	133,093	129,267
15 - 19	160,283	163,357	167,925	175,528	183,762	193,548
20 - 24	165,052	163,396	161,999	160,836	161,940	162,891
25 - 29	175,079	174,196	172,860	171,200	169,427	167,664
30 - 34	175,974	177,865	179,500	179,692	179,314	178,530
35 - 39	169,441	170,433	171,430	173,780	176,229	178,561
40 - 44	158,068	161,531	164,707	166,379	167,673	168,765
45 - 49	140,093	141,961	144,108	147,472	150,970	154,477
50 - 54	124,829	126,907	129,007	130,551	132,065	133,668
55 - 59	107,076	108,053	109,136	110,680	112,384	114,334
60 - 64	92,936	93,412	93,884	94,468	95,088	95,747
65 - 69	76,446	77,148	77,823	78,252	78,623	79,162
70 - 74	55,407	56,631	57,704	58,722	59,640	60,455
75 - 79	33,652	34,436	35,300	35,210	37,049	37,828
80 - 84	16,479	16,353	17,224	17,583	17,941	18,347
85 - 89	5,331	5,951	6,041	6,138	6,265	6,391
90 - 94	1,377	1,392	1,402	1,418	1,459	1,457
95 - 99	198	196	194	193	194	195
100+	18	18	18	18	18	18
Total	2,160,311	2,192,824	2,204,578	2,215,655	2,225,963	2,235,765

Age	1960	1961	1962	1963	1964	1965
Under 5	144,704	143,269	142,082	141,131	140,398	139,835
5 - 9	156,490	154,600	152,507	150,505	148,647	146,996
10 - 14	171,572	166,642	164,143	162,641	161,195	159,595
15 - 19	199,917	201,905	198,319	191,702	182,215	175,257
20 - 24	165,943	170,477	173,027	186,205	195,219	202,240
25 - 29	166,020	164,652	163,476	164,569	165,515	168,545
30 - 34	177,652	176,326	174,678	172,917	171,166	169,534
35 - 39	180,433	182,129	182,307	181,931	181,154	180,283
40 - 44	169,743	170,729	173,037	175,446	177,736	179,572
45 - 49	157,349	160,959	162,563	163,822	164,886	165,839
50 - 54	135,458	137,455	140,687	144,035	147,387	150,604
55 - 59	116,153	118,147	119,511	120,912	122,400	124,066
60 - 64	96,732	97,698	98,083	100,614	102,268	103,901
65 - 69	79,558	79,958	80,448	80,970	81,529	82,357
70 - 74	60,977	61,500	61,831	62,173	62,541	62,852
75 - 79	38,658	39,403	40,074	40,685	41,223	41,579
80 - 84	18,757	19,233	19,730	20,181	20,596	21,055
85 - 89	6,537	6,679	6,815	6,954	7,111	7,270
90 - 94	1,474	1,497	1,522	1,557	1,589	1,626
95 - 99	197	199	201	204	207	210
100+	17	17	17	17	17	17
Total	2,244,861	2,253,428	2,261,558	2,269,171	2,276,399	2,283,233

TABLE VII. THE EXPECTATION OF FEMALE POPULATION IN ONTARIO

Age	1941	1942	1943	1944	1945	1946	1947
Under 5	153,910	161,162	168,889	173,273	183,875	185,657	183,004
5 - 9	140,606	147,177	148,112	148,771	151,942	156,139	163,197
10 - 14	160,199	158,215	156,162	154,172	152,338	150,787	149,363
15 - 19	166,933	167,018	166,532	165,611	164,321	162,721	160,737
20 - 24	160,410	162,376	164,371	166,277	167,971	169,345	169,368
25 - 29	155,783	157,180	158,325	159,294	160,197	161,130	163,034
30 - 34	140,912	144,215	147,491	150,630	153,526	156,083	157,476
35 - 39	129,275	131,350	133,644	136,116	138,762	141,566	144,834
40 - 44	122,034	122,927	123,934	125,105	126,483	128,107	130,160
45 - 49	113,203	114,505	115,761	116,964	118,093	119,126	120,002
50 - 54	104,055	105,270	106,353	107,361	108,347	109,380	110,637
55 - 59	87,718	89,312	91,963	94,085	96,110	97,956	99,110
60 - 64	74,361	75,951	77,423	78,837	80,212	81,575	83,524
65 - 69	58,613	60,394	62,228	64,070	65,808	67,696	69,106
70 - 74	44,468	45,495	46,547	47,657	48,854	50,114	51,608
75 - 79	29,323	30,014	30,755	31,513	32,322	33,177	33,929
80 - 84	16,022	16,357	16,685	17,021	17,346	17,633	18,099
85 - 89	6,130	6,432	6,655	6,850	7,039	7,207	7,336
90 - 94	1,589	1,635	1,682	1,728	1,773	1,817	1,906
95 - 99	299	275	278	296	316	332	338
100+	34	30	29	29	29	30	27
Total	1,873,937	1,897,806	1,923,633	1,950,670	1,975,744	1,997,628	2,016,845

Age	1948	1949	1950	1951	1952	1953
Under 5	176,285	167,657	160,107	155,067	152,145	150,619
5 - 9	170,860	180,198	185,785	187,874	185,319	178,429
10 - 14	150,304	150,954	154,114	158,300	165,380	173,069
15 - 19	158,692	156,711	154,883	153,330	151,965	152,942
20 - 24	168,876	167,960	166,687	165,088	163,195	161,234
25 - 29	165,067	166,960	168,633	169,994	170,110	169,722
30 - 34	158,607	159,566	160,463	161,387	163,416	165,472
35 - 39	143,075	151,184	154,051	156,582	158,067	159,292
40 - 44	132,413	134,848	137,455	140,220	143,546	146,845
45 - 49	120,990	122,137	123,480	125,081	127,188	129,501
50 - 54	111,854	113,021	114,114	115,113	116,070	117,124
55 - 59	100,138	101,096	102,038	103,026	104,299	105,535
60 - 64	85,525	87,495	89,372	91,079	92,260	93,326
65 - 69	70,413	71,672	72,896	74,113	76,021	77,951
70 - 74	53,145	54,686	56,204	57,712	59,128	60,427
75 - 79	34,703	35,522	36,408	37,341	38,621	39,946
80 - 84	18,543	18,998	19,475	19,930	20,460	20,965
85 - 89	7,478	7,624	7,768	7,916	8,114	8,330
90 - 94	1,969	2,024	2,076	2,121	2,175	2,238
95 - 99	344	355	365	372	392	403
100+	28	29	31	33	32	33
Total	2,034,316	2,050,697	2,066,415	2,081,742	2,097,903	2,113,403

TABLE VII. THE EMANCIPATION OF FEMALE POPULATION IN ONTARIO (Concluded)

Age	1954	1955	1956	1957	1958	1959
Under 5	149,121	147,482	145,600	143,565	141,615	139,830
5 - 9	169,912	162,480	157,410	154,643	153,122	151,625
10 - 14	182,432	188,061	190,198	187,646	180,768	172,266
15 - 19	153,628	156,816	161,031	163,097	175,767	185,109
20 - 24	159,315	157,552	156,063	154,692	155,666	156,349
25 - 29	168,902	167,719	166,202	164,316	162,364	160,452
30 - 34	167,450	169,186	170,629	170,743	170,537	169,542
35 - 39	160,351	161,342	162,354	164,368	166,408	168,359
40 - 44	150,012	152,943	155,553	157,021	158,232	159,278
45 - 49	132,005	134,681	137,505	140,781	144,026	147,143
50 - 54	110,310	119,702	121,550	123,378	125,629	128,063
55 - 59	106,730	107,871	108,934	109,840	110,856	112,000
60 - 64	94,334	95,312	96,312	97,500	98,654	99,769
65 - 69	79,820	81,500	83,195	84,249	85,206	86,111
70 - 74	61,685	62,914	64,113	65,738	67,387	68,976
75 - 79	41,263	42,579	43,905	44,957	45,920	46,859
80 - 84	21,507	22,087	22,720	23,492	24,289	25,079
85 - 89	8,557	8,808	9,060	9,264	9,487	9,730
90 - 94	2,304	2,362	2,409	2,468	2,535	2,605
95 - 99	415	428	439	450	461	475
100+	34	36	37	39	40	42
Total	2,128,083	2,141,941	2,154,999	2,167,255	2,178,789	2,189,661

Age	1960	1961	1962	1963	1964	1965
Under 5	138,243	136,872	135,739	134,331	134,132	133,596
5 - 9	149,996	148,120	146,092	144,149	142,371	140,790
10 - 14	164,844	159,782	157,020	155,502	154,009	152,380
15 - 19	190,723	192,852	190,303	183,442	174,961	167,557
20 - 24	157,327	163,731	170,773	178,419	187,729	193,323
25 - 29	158,694	157,211	155,846	156,819	157,503	160,668
30 - 34	163,366	166,856	164,883	163,040	161,140	159,395
35 - 39	170,094	171,527	171,633	171,254	170,444	169,276
40 - 44	160,259	161,261	163,254	165,272	167,202	168,917
45 - 49	150,826	152,591	154,055	155,223	156,250	157,216
50 - 54	130,665	133,412	136,602	139,760	142,790	145,591
55 - 59	113,323	114,837	116,848	119,003	121,334	123,824
60 - 64	100,834	101,828	102,621	103,621	104,690	105,933
65 - 69	86,998	87,314	88,961	89,996	90,998	91,953
70 - 74	70,466	71,331	72,723	73,532	74,300	75,052
75 - 79	47,785	48,697	49,934	51,178	52,367	53,476
80 - 84	25,865	26,654	27,271	27,840	28,397	28,954
85 - 89	9,994	10,279	10,625	10,982	11,331	11,677
90 - 94	2,681	2,754	2,812	2,877	2,950	3,032
95 - 99	486	497	508	521	535	549
100+	42	43	44	45	47	48
Total	2,199,110	2,209,579	2,218,692	2,227,306	2,235,480	2,243,207

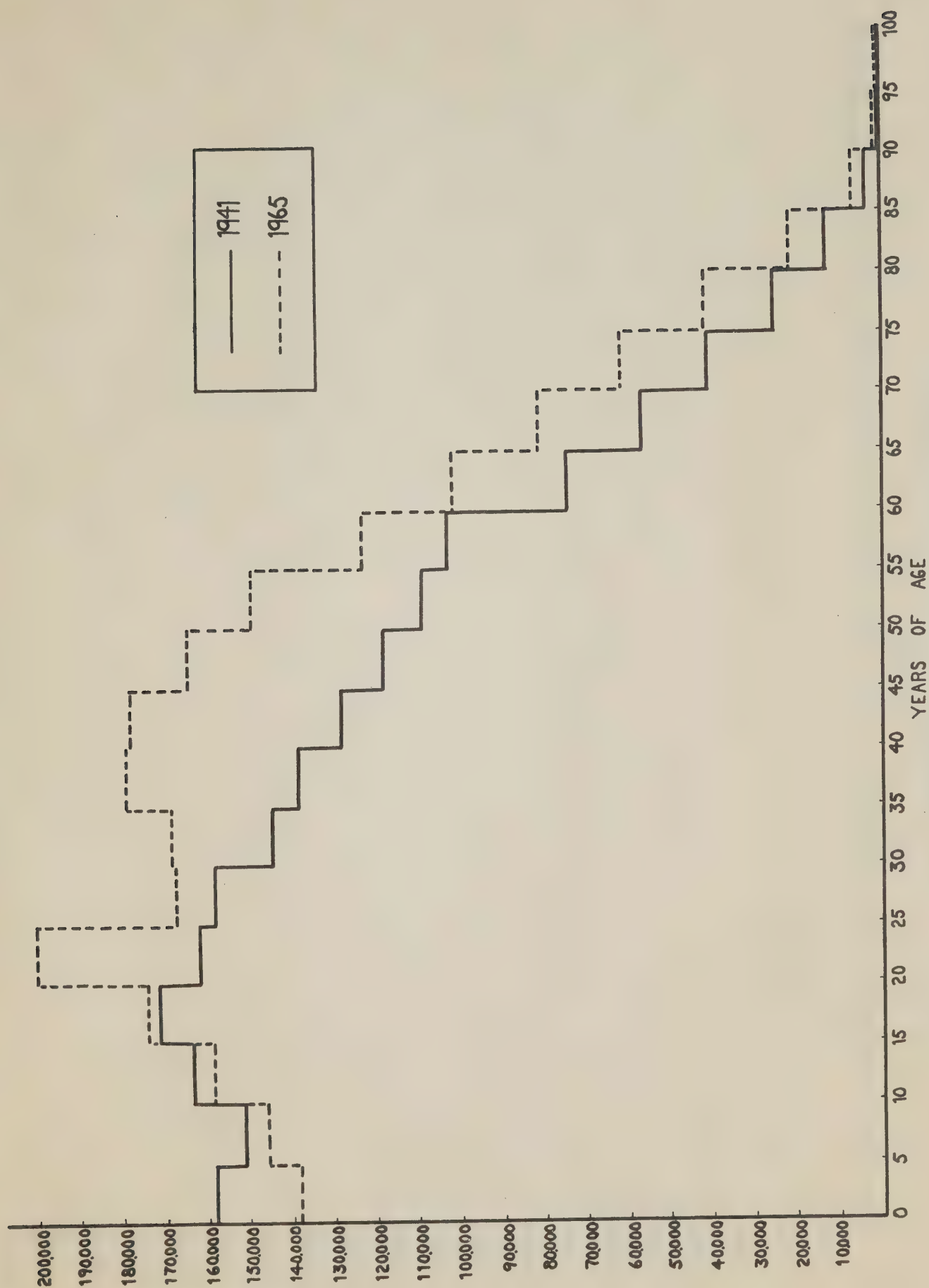


FIG. 5. THE NUMBER OF MALES IN ONTARIO

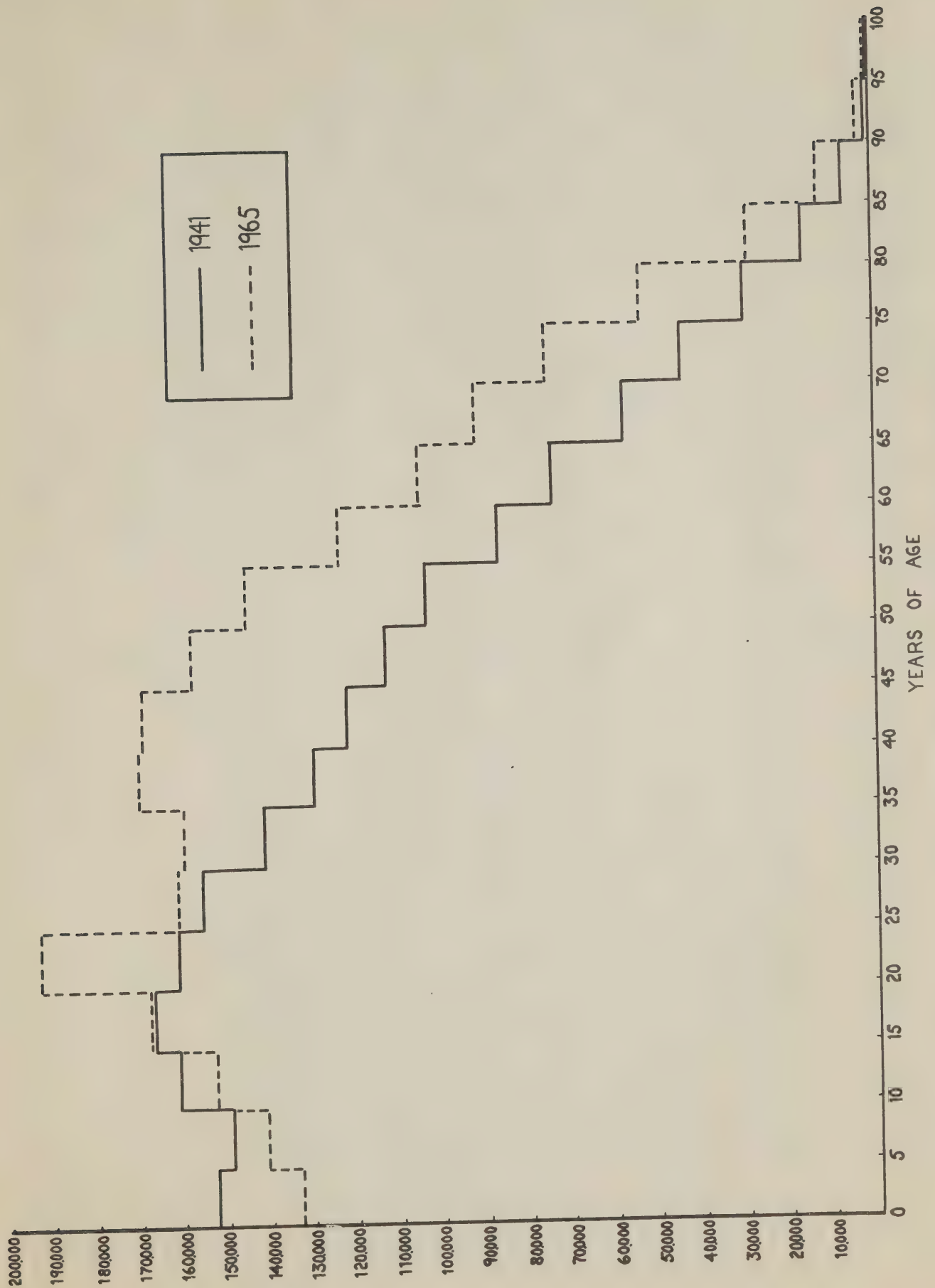


FIG. 6. THE NUMBER OF FEMALES IN ONTARIO

TABLE VIII. THE ESTIMATION OF TOTAL POPULATION IN ONTARIO.

Age	1941	1942	1943	1944	1945	1946	1947
Under 5	313,189	328,496	344,548	363,848	375,842	379,539	373,651
5 - 9	301,515	296,840	300,885	302,450	303,684	317,474	332,163
10 - 14	324,804	321,044	317,111	313,243	309,664	306,632	303,976
15 - 19	339,116	338,942	337,968	336,143	333,857	330,816	327,065
20 - 24	323,989	320,280	322,671	336,083	340,407	343,419	343,450
25 - 29	315,706	310,762	321,178	323,186	325,010	326,867	331,127
30 - 34	286,504	293,293	300,205	306,983	313,376	319,153	322,161
35 - 39	268,380	272,059	275,957	280,127	284,661	289,635	296,347
40 - 44	250,321	253,025	256,075	259,313	262,896	266,746	270,365
45 - 49	232,617	234,980	237,333	239,604	242,011	244,318	246,957
50 - 54	214,094	216,036	217,811	219,543	221,298	223,200	225,472
55 - 59	181,734	185,666	189,542	193,243	196,506	199,423	201,258
60 - 64	149,626	153,201	156,641	159,908	163,197	166,302	169,912
65 - 69	116,342	119,562	122,673	125,963	129,265	132,640	135,734
70 - 74	85,883	87,739	89,733	91,742	93,920	96,197	98,731
75 - 79	55,233	56,321	57,526	58,782	60,124	61,576	62,890
80 - 84	29,619	30,050	30,469	30,931	31,405	31,898	32,537
85 - 89	11,039	11,511	11,877	12,158	12,397	12,616	12,780
90 - 94	2,679	2,777	2,863	2,937	3,012	3,075	3,207
95 - 99	466	412	412	444	483	515	526
100+	59	50	49	49	48	47	41
Total	3,802,920	3,851,054	3,903,532	3,957,560	4,008,063	4,052,068	4,090,355

Age	1943	1949	1950	1951	1952	1953
Under 5	359,616	341,987	326,563	316,662	310,996	307,952
5 - 9	348,068	367,232	379,188	383,219	377,565	363,510
10 - 14	305,985	307,549	313,755	322,493	337,210	353,164
15 - 19	323,150	319,303	315,741	312,727	310,183	312,271
20 - 24	342,474	340,660	338,399	335,373	331,808	328,062
25 - 29	335,482	339,660	343,145	346,130	346,359	345,591
30 - 34	324,558	326,546	328,325	330,162	334,564	339,091
35 - 39	303,179	307,893	316,201	321,809	325,077	327,623
40 - 44	274,200	278,300	282,759	287,654	294,428	301,313
45 - 49	249,375	253,092	256,586	260,344	264,015	267,916
50 - 54	227,743	230,003	232,242	234,459	237,075	239,965
55 - 59	202,933	204,553	206,220	208,024	209,912	211,679
60 - 64	173,468	176,855	179,843	182,515	184,210	185,799
65 - 69	138,690	141,515	144,359	147,051	150,225	153,340
70 - 74	101,272	103,947	106,831	109,370	112,128	114,675
75 - 79	64,311	65,741	67,297	68,924	70,870	72,351
80 - 84	33,240	33,966	34,735	35,564	36,298	37,121
85 - 89	12,961	13,158	13,363	13,571	13,835	14,135
90 - 94	3,302	3,378	3,442	3,499	3,543	3,607
95 - 99	536	551	566	577	595	604
100+	42	43	46	50	50	51
Total	4,125,085	4,157,927	4,189,411	4,220,257	4,250,946	4,280,520

TABLE VIII. THE IMPLICATION OF TOTAL POPULATION IN ONTARIO (Concluded)

Age	1954	1955	1956	1957	1958	1959
Under 5	304,991	301,734	297,951	293,811	289,847	286,193
5 - 9	346,138	330,985	320,969	315,696	312,669	309,722
10 - 14	372,358	384,387	388,524	382,882	368,861	351,533
15 - 19	313,911	320,173	328,956	343,625	359,529	378,657
20 - 24	324,367	320,948	318,062	315,528	317,606	319,240
25 - 29	343,981	341,915	339,062	335,516	331,791	328,116
30 - 34	343,412	347,051	350,209	350,435	349,671	348,072
35 - 39	329,792	331,775	333,784	338,148	342,637	346,920
40 - 44	308,080	314,474	320,260	323,400	325,905	328,043
45 - 49	272,098	276,642	281,613	288,253	294,996	301,620
50 - 54	243,147	246,609	250,337	253,929	257,694	261,731
55 - 59	213,806	215,929	218,070	220,528	223,240	226,334
60 - 64	187,270	188,724	190,196	191,968	193,742	195,516
65 - 69	156,266	158,728	161,018	162,501	163,899	165,273
70 - 74	117,092	119,545	121,817	124,460	127,027	129,431
75 - 79	74,915	77,015	79,205	81,167	82,969	84,687
80 - 84	37,986	38,940	39,944	41,075	42,230	43,426
85 - 89	14,438	14,759	15,101	15,402	15,752	16,121
90 - 94	3,681	3,754	3,811	3,886	3,974	4,062
95 - 99	613	624	633	643	655	670
100+	52	54	55	57	58	59
Total	4,308,394	4,334,765	4,359,577	4,382,910	4,404,752	4,425,426
Age	1960	1961	1962	1963	1964	1965
Under 5	282,947	280,141	277,821	275,962	274,530	273,431
5 - 9	306,486	302,720	298,519	294,654	291,018	287,786
10 - 14	336,416	326,424	321,163	318,143	315,204	311,975
15 - 19	390,640	394,755	388,122	375,144	357,876	342,814
20 - 24	325,470	334,208	340,800	364,624	383,648	395,563
25 - 29	324,714	321,843	319,322	321,388	323,018	329,213
30 - 34	346,018	343,182	338,661	335,957	332,306	328,929
35 - 39	350,527	353,656	353,945	353,185	351,598	349,559
40 - 44	330,002	331,986	336,291	340,718	344,938	348,489
45 - 49	307,875	313,530	316,598	319,045	321,136	323,055
50 - 54	266,123	270,867	277,289	283,795	290,177	296,195
55 - 59	229,481	233,034	236,359	239,915	243,734	247,890
60 - 64	197,566	199,526	201,764	204,235	206,958	209,834
65 - 69	166,550	167,852	168,409	170,966	172,527	174,310
70 - 74	131,463	133,331	134,554	135,705	136,841	137,904
75 - 79	86,443	88,100	90,008	91,863	93,590	95,055
80 - 84	44,622	45,887	47,001	48,021	48,993	50,009
85 - 89	16,531	16,958	17,440	17,936	18,442	18,947
90 - 94	4,155	4,251	4,334	4,434	4,539	4,658
95 - 99	683	696	709	725	742	759
100+	59	60	61	62	64	65
Total	4,444,771	4,463,007	4,480,250	4,496,477	4,511,879	4,526,440

6. Acknowledgements.

The present study was suggested by Dr. L. S. Penrose who followed the progress of the work and guided its developement. Grateful acknowledgement must be made to Mr. J. T. Marshall, Mr. N. Keyfitz and Dr. Enid Charles, of the Dominion Bureau of Statistics, for data provided in advance of publication and for good advice. Miss I. M. Judson, Department of the Registrar-General of Ontario, was most helpful. The illustrations are due to Mr. J. A. McClure. Miss A. Clarke helped the progress of the work and set it out in final forms.

Geoffrey Beall and R. G. Stanton

Division of Psychiatric Research

July 1944.

Appendix A. Current (1944) high birth rates.

As is well-known, the number of births recorded in Ontario, currently, i.e., since the start of the Second German War, has risen considerably over that obtaining in the years immediately previous, as is indicated in the second column of Table IX. In that table, the number

TABLE IX. ANTICIPATED (LIVE) BIRTHS UNTIL 1965

Year	Expected from trend	Observed births	Excess over trend	Adjusted figure
1940	67,683	68,524	841	68,524
1941	67,304	72,262	4,958	72,262
1942	67,192	78,192 ¹³	11,000	78,192
1943	67,033	83,425 ¹³	16,392	83,425
1944	66,818			83,210
1945	66,549			77,549
1946	66,208			71,166
1947	65,748			66,589
1948	65,204			
1949	64,590			
1950	63,898			
1951	63,143			
1952	62,273			
1953	61,422			
1954	60,513			
1955	59,661			
1956	58,831			
1957	58,009			
1958	57,472			
1959	56,939			
1960	56,552			
1961	56,162			
1962	55,897			
1963	55,753			
1964	55,704			
1965	55,526			

¹³ For 1943, the birth returns were not in fully at the time of writing but for the first two quarters the tentative figure was 41,274, against the final figure of 38,686 in 1942.

of births to have been anticipated, on the basis of the number of women, by age, present in Ontario and of the annual interpolates of birth rate, by age of women, is shown as the value expected from the birth trend. It will be seen how rapid has been the increase in the excess of births reported over births expected. It may be argued that this departure from a general trend, with time, towards fewer births will be balanced to some extent, by a compensating negative departure in the not distant future. Nevertheless, there can be no doubt that use of the trend indicated in Sect. 3 will underestimate the immediate expectation of births. Assuming that the figure for 1944 will prove as far in excess of the trend as that for 1943, that the figure for 1945 will be as excessive as that for 1942, etc., allowances were made for excesses of the trend until 1947. The final estimates of births by years is shown as adjusted figures in the last column of Table IX until 1947, after which time the trend values were used. The births were broken down into sexes on the assumption that 51.33% would be male as in the calendar years 1921-41, inclusive.

Appendix B. False returns for young children

Since, as is well-known, the census returns for young children tend to be defective, it was necessary to examine closely these data. Accordingly, the number of children, under one year of age, that should have been reported on June 1, 1921, from the records of births, by preceding months, and the survival table in the first year of life, in 1921, was calculated and found appreciably (6,369) higher than the census return, as can be seen from the first line of Table X. The corresponding results for 1931 were similar. In 1931, the further corresponding results were found for older children, from the probability of survival (calculated for a first estimate from the census returns for each year of life after the first), and from births during the preceding decade. These results, in Table X, also

TABLE 2. CENSUS FIGURES TO BE DERIVED FROM MARRIAGE AND DIVORCE REGISTRARS.

Ages in Years	MARRIAGES			DIVORCES		
	Estimates from Birth Registrations	Census Report	Discrepancy or Migration	Estimates from Birth Registrations	Census Report	Discrepancy or Migration
Under 1	34,447	31,116	-3,331	33,076	30,038	-3,038

Ages in Years	MARRIAGES			DIVORCES		
	Estimates from Birth Registrations	Census Report	Discrepancy or Migration	Estimates from Birth Registrations	Census Report	Discrepancy or Migration
Under 1	33,819	29,711	-4,208	32,718	28,605	-4,023
0	33,377	29,809	-3,590	32,646	28,095	-3,551
1	31,889	31,890	1	30,846	30,928	82
2	31,771	32,268	497	30,848	31,679	1,130
3	31,069	32,473	1,414	30,099	31,182	1,083
4	30,863	32,864	2,001	29,806	31,729	1,823
5	31,865	33,663	1,798	30,788	32,747	1,959
6	32,085	34,038	1,954	31,856	32,383	1,427
7	31,505	34,205	2,700	30,896	33,491	3,025
8	31,608	34,015	2,405	31,120	33,390	2,270
9	33,005	35,517	2,512	32,830	34,324	2,494
10						

Ages in Years	MARRIAGES			DIVORCES		
	Estimates from Birth Registrations	Census Report	Discrepancy or Migration	Estimates from Birth Registrations	Census Report	Discrepancy or Migration
Under 1	34,479	30,837	-4,241	37,206	2,215	-3,991
1 - 4	124,419	121,280	-3,159	120,227	117,212	-3,015

Table X, also suggest that the census underestimated the number of children one year old but there is little suggestion that those lost then were reported at greater ages, for which the discrepancy or migration is reasonably compatible with the general migration situation as shown in Table IV. In 1941, for which the census publications (for numbers of people by single years of life) had not been completed at the time of writing, the indications are of similar effects. The discrepancy between estimates and census figures for the first year of life is shown in Table XI as the number of children from the census relative to the number expected from birth and death registrations. The ratio is curiously independent of sex and surprisingly close for the two later dates, 1931 and 1941.

TABLE XI. THE NUMBER OF CHILDREN, UNDER ONE, FROM THE CENSUS RELATIVE TO THE NUMBER EXPECTED FROM REGISTRATIONS

	MALE	FEMALE
1921	.903	.908
1931	.876	.877
1941	.877	.877

Working from the experience of 1931, adjustments were made in the number of children one year old. In 1921 the value given by the census was adjusted, first, for the discrepancy shown that year for children under one, and, secondly, for the discrepancies shown in the first and second years of life in 1931 to give 32,875 boys and 32,172 girls. For 1941 the estimates from birth registrations were used for the first two years of life (32,940 boys and 32,096 girls, one year old) so that, if the discrepancies were supposed in same proportions as in 1931, for this age, then there were, very reasonably, 382 more boys and 477 more girls from 2 to 4 years old reported by the census than were estimated from the birth registrations. For children under two, the estimates from birth registrations were assumed more

nearly correct than the census figures and substituted. The death rates for children of one, were adjusted to the new basis.

Appendix C. Anticipated Migration.

To forecast the migration into Ontario (including, of course, interprovincial migration) is hazardous but since, as shown in Sect. 4, it has, in the recent past, played a considerable part in determining changes in the population, it must be considered. No doubt the trends of the last two decades will continue to some extent for two more. Accordingly, the number of migrants for the two decades to come will be presumed to lie between

TABLE XIII. MIGRATION (INCLUDING FALSE DECLARATION
OF AGE) ANTICIPATED FOR THE PERIOD 1941 TO 1965

Year of age	MIGRANTS		FEMALE	
	For 5-year group For decade	For year of life, per year	For 5-year group For decade	For year of life, per year
0-4	1,150	144	1,386	143
5-9	7,196	117	7,156	106
10-14	5,828	185	5,325	102
15-19	8,245	163	5,124	158
20-24	8,376	125	7,117	87
25-29	6,268	183	4,350	47
30-34	9,148	194	2,355	23
35-39	9,680	141	4,664	75
40-44	7,054	10	3,742	-44
45-49	504	23	-2,203	17
50-54	1,398	-63	856	-55
55-59	-3,415	-52	-2,763	-36
60-64	-2,624	53	-1,820	62
65-69	2,635	45	3,022	53
70-74	2,262	14	2,639	27
75-79	676	5	1,356	14
80-84	242	6	686	15
85-89	293	1	760	5
90-94	39	0	252	2
95-99	-10	0	73	0
Total	65,945		44,947	

the values for 1921-31 (a period of prosperity) and for 1931-41 (the converse). The average of these two migrations appears in Table XII as the migration anticipated, per decade, in the near future. In order to get roughly such an effect by the addition of an annual increment, the increment for a decade over 5 years of life, was divided by 50 and set back 4 years, as indicated as "per years of life, per year". The latter annual increments were used in estimating the future population in Sect. 5.

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